

CLAIMS

I claim:

1. A method for injecting materials into a cell or an intracellular structure, comprising:

penetrating the cell membrane of the cell with a liquid-filled capillary; and

applying electric current to the said capillary to propel the flow of the liquid inside the said capillary into the cell by electroosmosis.

2. A method according to claim 1, further comprising the step of penetrating the membrane of the intracellular structure before applying electric current to the said capillary to propel the flow of the liquid inside the said capillary into the intracellular structure by electroosmosis.

3. A method according to claim 1, wherein the electric current is a direct current.

4. A method according to claim 1, wherein the capillary is a silica glass capillary.

5. A method according to claim 1, wherein the capillary is positioned by the use of a 3-dimensionally positioning device.

6. A method according to claim 1, wherein the cell is an egg.

7. A method according to claim 2, wherein the liquid contains at least DNA.

8. A method according to claim 2, wherein the intracellular structure is a nucleus of an egg.

9. A method according to claim 2, wherein the capillary is a silica glass capillary.

10. A method according to claim 2, wherein the capillary is positioned by the use of a 3-dimensionally positioning device.

11. A device for injecting materials into a cell or an intracellular structure, comprising:

an electric power supply; and

a liquid-filled capillary operatively connected to the said electric power supply;

wherein the cell membrane of the cell is mechanically penetrated by the said capillary and electric current is delivered to the said capillary to propel the flow of liquid inside the said capillary into the cell or the intracellular structure by electroosmosis.

12. A device according to claim 11, wherein the membrane of the intracellular structure is mechanically penetrated by the said capillary before the electric current is delivered to the said capillary to propel the flow of liquid inside the said capillary into the intracellular structure by electroosmosis.

13. A device according to claim 11, wherein the current from the electric power supply is a direct current.

14. A device according to claim 11, further comprising a foot switch to control the output of the electric current.

15. A device according to claim 11, further comprising a timing device to control the duration of the output of the electric current.

16. A device according to claim 11, further comprising a micro-syringe connecting to the said capillary to regulate the hydraulic pressure inside the said capillary.

17. A device according to claim 11, further comprising a piece of non-conductive material being placed outside capillary-holding device to electrically insulate the capillary-holding device.

18. An electrode for transmitting electric current from capillary-holding device to liquid inside capillary, comprising an electrode being placed inside the capillary and the capillary-holding device wherein the said electrode is physically independent of the capillary-holding device.

19. An electrode according to claim 18, wherein the electrode has one or more curved shapes.

20. An electrode according to claim 18, wherein the electrode is a metal wire of 20 cm or less in length and 10 AWG or smaller in diameter.